
Taxonomic Revision of the *Casearia ulmifolia* Complex (Salicaceae)

Ronaldo Marquete

Instituto Brasileiro de Geografia e Estatística, Av. República do Chile 500, 15° andar, Rio de Janeiro, RJ, CEP 20031-170, Brazil, and Jardim Botânico do Rio de Janeiro, Programa de Pós Graduação em Botânica, Rua Pacheco Leão, 2040, Rio de Janeiro, RJ, 22460-030, Brazil. marquete@ibge.gov.br; rmarquet@jbrj.gov.br

Vidal de F. Mansano

Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, Rua Pacheco Leão 915, Rio de Janeiro, RJ, 22460-030, Brazil. vidalmansano@gmail.com

ABSTRACT. Field studies and examination of herbarium specimens have led to a taxonomic revision of the *Casearia ulmifolia* Vahl ex Vent. complex (Salicaceae). A new species circumscription is presented for *C. ulmifolia*, *C. cotticensis* Uittien is reestablished, and one new species, *C. murceana* R. Marquete & Mansano, is described from Pará, Brazil. Morphological descriptions, a taxonomic key, geographical distributions, diagnostic characteristics of the species, and illustrations are provided.

Key words: Brazil, *Casearia*, Flacourtiaceae, IUCN Red List, Pará, Salicaceae, South America.

Casearia Jacq. (Salicaceae, which now includes the non-cyanogenic Flacourtiaceae, Chase et al., 2002; Angiosperm Phylogeny Group, 2009) is a pantropical genus that includes ca. 180 species occurring in many different vegetation types ranging from dense ombrophilous forests, seasonal semi-deciduous forests, savannas, and coastal vegetation. Sleumer (1980) cited 80 species of *Casearia* in the Neotropics and subdivided this genus into six sections, with *Casearia* sect. *Casearia* further considered as six informal groups. *Casearia ulmifolia* Vahl ex Vent. belongs to the Arboreae group of the *Casearia* sect. *Casearia*, which comprises 10 species.

While reviewing *Casearia* species in Brazil for taxonomic study (Marquete, unpublished), we noted that Sleumer (1980) broadly circumscribed *C. ulmifolia*, synonymizing 10 names in recognition of this species. This resulted in a taxon with broad morphological variation. *Casearia ulmifolia*, for instance, has flowers with oblong anthers, an undeveloped connective with apical glands slightly barbate to glabrous, longitudinal anther dehiscence with lateral dehiscent zones, and stigmas with dispersed hirsute trichomes. In contrast, the flowers of *C. cotticensis* Uittien present deltoid anthers, a developed connective with glabrous or subglabrous

apical glands, transverse anther dehiscence with dehiscent zones oriented downward, and stigmas that are tomentose. Despite these distinctions, Sleumer (1980) considered these taxa conspecific.

The complex *Casearia ulmifolia* studied here is characterized by its stipule shape (subulate or linear-lanceolate) and indument (villous or tomentose), leaf blade with acuminate to cuspidate apex, oblong or deltoid anthers, barbate, glabrous or tomentose apical gland, elongated, ovate ovary, and slightly sulcate or fimbriate seed testa.

Species of the *Casearia ulmifolia* complex occur in the Amazon region bordered by the states of Mato Grosso to the south and the states of Roraima and Amapá to the north. This distribution reaches the Atlantic coast of southeastern Brazil, since the complex extends from Maranhão and Piauí southward to Bahia, Espírito Santo, and Minas Gerais. These species also occur in other South American countries such as Colombia, Guyana, Peru, Surinam, Trinidad, and Venezuela. These plants were noted to grow at altitudes from 50 to 950 m. The species of this complex occur in dense ombrophilous forests and its variations, according to Veloso et al. (1991).

Despite the fact that *Casearia cotticensis* and *C. ulmifolia* are distributed in close localities, they are morphologically distinct. They differ by leaf texture, trichomes, venation, and especially anther dehiscence. *Casearia murceana* R. Marquete & Mansano, found in Pará State in eastern Amazonia, is more similar to *C. ulmifolia*, differing by the inflorescence structure, absence of glands, and flower indument.

Sleumer (1954, 1980), who studied the Malaysian (eight species) and Neotropical species of Flacourtiaceae, respectively, and Breteler (2008), in his work for *Casearia* from Africa, mentioned that the flowers of the genus do not offer characters to distinguish the species. We verified that floral characters in the

Brazilian species are very helpful for identifying species of *Casearia*.

MATERIALS AND METHODS

The present survey is based on collections deposited in the following herbaria: BHCB, C, CEN, CESJ, F, G, Sergio Tavares, Universidade Federal Rural de Pernambuco, Recife, Pernambuco, HUEFS, IAN, INPA, K, L, MG, MO, NY, P, R, RB, RBR, TEPB, U, UB, and UEC. Our collected material was deposited in RB, and additional duplicates were sent to international herbaria (B, F, L, MO, NY, P, USMS). Expeditions were conducted in the following regions of Brazil: Amazonia and central and southeastern Brazil, where the species were not located, but the habitat was observed.

The morphological terminology follows Hickey and King (2000), Font Quer (1979), and Stern (1992). The geographical distribution maps of the species were drawn using the geographic information system (GIS), each specimen having its locality georeferenced. The vegetation formations used here follow the *Classification System of the Brazilian Vegetation* by Veloso et al. (1991), adapted to a universal system, and the map of Brazilian vegetation (IBGE, 2004).

1. *Casearia cotticensis* Uittien, Recueil Trav. Bot. Néerl. 22: 369, fig. 9. 1926. TYPE: Suriname. Cottica River, 21 June 1921, *L. Gonggrijp BW*. 5332 (holotype, U [barcode] 0002179 not seen, U photo; isotypes, K [barcode] 000471158 not seen, K photo, RB). Figure 1.

Casearia reginae J. F. Macbr. Publ. Field Mus. Nat. Hist., Bot. Ser. 15: 356. 1936, nom. inval. TYPE: Peru. Loreto: La Victoria, *L. Williams 2758* (holotype, F-612974 not seen, F neg. 059654 of F-612974; isotypes, G, US not seen).

Tree or small tree (6–)10–18(–27) m tall \times (12–)20 cm DBH; trunk with smooth bark, ca. 1 mm thick, brown-orange, not fibrous; sapwood cream-colored, slightly oxidizing; branches terete, without thorns, glabrous, glabrescent at base and sparsely villous at apex in some specimens; branches black at apex, brown at base; lenticels rhombic to elliptical. Stipules 10×0.5 –1 mm, linear to lanceolate, caducous, tomentose on both faces, encountered more frequently on the apex of young branches, eglandular. Leaves persistent, variable in size and shape; blades (6.5–)7–12.5(–17.5) \times (2–)2.5–4.5(–8) cm, asymmetrically lanceolate, narrowly elliptical, oblong-lanceolate, coriaceous (chartaceous to membranaceous when young), opaque on both faces, glabrescent on both faces to tomentose on primary and secondary veins

(abaxially tomentose when young), apex caudate to short caudate with sharp tip, base slightly attenuate, widely attenuate to asymmetrical, margins serrate to serrulate with glands on the serrations; translucent dots, densely dispersed on blade (difficult to see with the naked eye on some leaves); (4)5 to 7(to 10) pairs of widely ascendant secondary veins, venation lax and more prominent on abaxial face, primary vein prominent on adaxial face; petiole (3–)4–7 mm, slender semi-terete, glabrous, thin. Inflorescences fasciculate, multiflowered, 15 to 20+, densely tomentose, subsessile; peduncule (0.5–)2–5 mm long, sparsely tomentose, slightly flattened; bracts 1–1.5 \times 0.5–0.9 mm, oval (conchiform), chartaceous, externally tomentose; bracteoles 3–4 \times 0.5–0.9 mm, widely subulate, membranaceous, yellowish, with elongated glands, tomentose externally; pedicels (1–)1.5–2(–4) mm, flattened, articulated, with 0.5–1 mm from branch insertion to articulation, tomentose. Flower buds 2.2 \times 1.5 mm, obovate to globose, white tomentose, greenish; sepals 5, (2–)3–4 \times (1–)1.5–2 mm, oval to oval-oblong, fused at disk base with lobes and filaments, with glands inside the lobes, perigynous, greenish, outer 3 with tomentose trichomes and inner 2 externally tomentose only from the central portion of the base almost to the apex, internally glabrous with glands, whitish on both faces; stamens with filaments (0.5–)1–2 mm, flattened, free, sparsely tomentose near base and anther, fused at disk base; anthers deltoid, pubescent, with transverse dehiscence, diminutive, rounded and oriented downward, connective expanded, apical prominent gland inside, glabrous or subglabrous; disk lobes ca. 0.5 mm long, clavate, flattened at apex, tomentose, whitish, fused at base and alternating with filaments; ovary ovate, glabrous; style ca. 0.7 mm, thick, glabrous to sparsely tomentose in some cases, yellowish; stigma with base dilated and thinning at apex, slightly ovoid, tomentose, whitish. Fruit 7 \times 3.5 mm, ovoid while immature, glabrous, reddish-green; seeds 2 to 5 per fruit, 2 \times 1.5 mm, oblong; testa foveolate, aril fimbriate, yellowish, partially covering the seed; embryo straight, ca. 0.5 mm long, yellow, fleshy, surface smooth; cotyledon leaves rounded, hypocotyl radicle axis cylindrical.

Distribution and habitat. *Casearia cotticensis* is found in the dense ombrophilous forests of Brazil. It has been collected from Guyana, Colombia, Peru, and Suriname.

Phenology. *Casearia cotticensis* flowers from January to June and occasionally in September and October, and fruits in March and April.

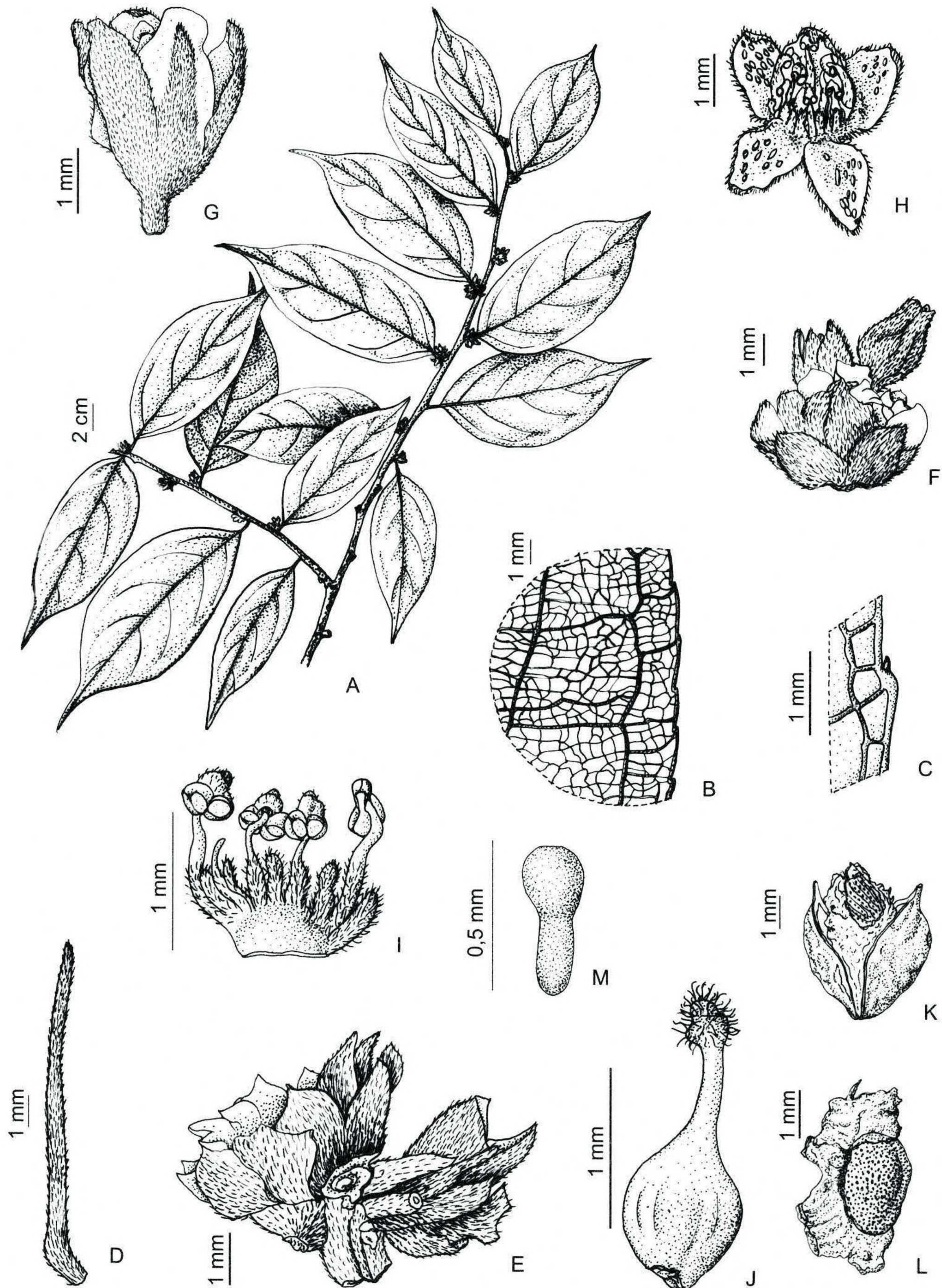


Figure 1. *Casearia cotticensis* Uittien. —A. Branch with inflorescences presenting buds and flowers. —B. Detail of leaf veins. —C. Detail of bristle with gland. —D. Stipule. —E. Peduncle with bracts and bracteoles. —F. Bracts and bracteoles surrounding the flowers. —G. Flower. —H. Flower with glands on sepal lobes. —I. Detail of stamens with anthers turned downward and filaments intercalated with the disk lobes. —J. Gynoecium with pilose stigma. —K. Fruit with seed and aril. —L. Seed with foveolate testa and fleshy aril. —M. Linear embryo. A, E, F, J from C. A. Sothers & C. F. da Silva 446 (INPA); B–D from A. Ducke s.n. (RB 21430); G from M. G. Silva & A. Pinheiro 4268 (RB); H, I from A. Ducke s.n. (RB 21430); K–M from C. A. Cid Ferreira 8718 (INPA).

Discussion. Analyses of the RB isotype of *Casearia cotticensis*, and the name *C. reginae* (Macbride, 1936), which was previously synonymized with *C. ulmifolia* by Sleumer (1980), led us to conclude that both names refer to a species that is distinct from *C. ulmifolia*. The characters that differentiate *C. cotticensis* from *C. ulmifolia* are the coriaceous leaves (when mature), the blades glabrescent to tomentose on both faces on the primary and secondary veins, the primary vein adaxially prominent, anthers deltoid with an expanded connective and glabrous apical gland, with transverse dehiscence turned downward, and a tomentose stigma.

Representative specimens examined. BRAZIL. **Acre:** Brasília, Reserva Extrativista Chico Mendes, seringal Porongaba, 22 Feb. 1992, *L. de Lima & R. Saraiva 328* (INPA, MO). **Amazonas:** Manaus, Estr. Manaus, Porto Velho, BR 319, Km. 265, 15 Apr. 1976, *O. P. Monteiro & J. Ramos 711* (INPA); Km. 540, 23 Apr. 1976, *O. P. Monteiro & J. Ramos 901* (INPA); Estr. Manaus, Caracará, Reserva Biol. do INPA, 1978, *A. Anderson s.n.* (INPA-142413); Estr. ZF 3, Km. 24, coletado ao lado da Reserva 1202, 17 June 1980, *J. Lima & B. Zimmerman 518* (INPA); Distr. Agropec., 90 km NNE de Manaus, Res. 1501 (Km. 41), 14 Apr. 1992, *A. A. Oliveira et al. 421* (INPA); Manaus, Itacoatiara, Km. 26, Reserva Florestal Ducke, 9 May 1995, *C. A. Sothers & C. F. da Silva 446* (INPA, MO-04928928, RB); Maués, igarapé Albino, afluyente do rio urupadí, 16 Sep. 1983, *J. Lima 553* (INPA). **Maranhão:** Santa Luzia, Faz. Agripec, Varig, caminho para o rio Mutum, margem do rio Pindaré, 5 Apr. 1983, *M. F. F. Silva et al. 1011* (IAN, MO-5952103, NY-897357). **Mato Grosso:** Aripuanã, Km. 238 da BR 174, núcleo Juína, 16 Jan. 1979, *M. G. Silva & A. Pinheiro 4268* (IAN, NY-897352, RB). **Pará:** Rio Tapajóz, 2 June 1923, *A. Ducke s.n.* (RB 21430); Almeirim, Mt. Dourado, bloco Bananal, estr. secund. entre áreas 15 e 43, 15 May 1986, *M. J. Pires & N. T. Silva 1043* (INPA); Altamira, rio Xingu, Res. Indíg. dos Assurinís, 27 Jan. 1987, *S. A. M. Souza et al. 856* (MG); Belém, bosque mun., 30 Jan. 1948, *N. T. da Silva 83* (IAN); Oriximiná, estr. Oriximiná-Óbidos, ca. 55 km de Oriximiná, 5 June 1980, *C. Davidson & G. Martinelli 10068* (INPA, MO-5952098); rio Cachorro, margem direita, pique do dique, 26 Aug. 1986, *C. A. Cid Ferreira 8056* (MG, MO, RBR); Santarém, Ipanema, 13 May 1927, *A. Ducke s.n.* (RB-21445); Alter do Chão. Área 65, 2°5'36"N, -54°9'25"W, 19 Mar. 2000, *J. C. da Costa s.n.* (INPA-212106); Área 69, 27 Apr. 2000 (fl.), *J. C. Costa s.n.* (INPA-212121). **Rondônia:** Ariquemes, 15 km de Ariquemes, BR 364, 13 Mar. 1987, *M. Nee 34359* (INPA, MO-5767906); Costa Marques, 10 km ao N da cidade de Costa Marques, 29 Mar. 1987, *C. A. Cid Ferreira 8718* (INPA, MO-04793140); Jiparaná, glebag-Km. 15, 7 Apr. 1983, *H. F. P. Filho & M. G. Silva s.n.* (INPA-116228); Porto Velho, Terr. Guaporé, 1952, *E. Cordeiro & J. F. da Silva 219* (RB); entrada da estr. Bom-Sossego, 27 Jan. 1983, *L. Carreira et al. 293* (IAN, MG). COLOMBIA. **Antioquia:** Valley of Rio Anorí, betw. Dos Bocas & Anorí, 1 Oct. 1984, *J. L. Zarucchi 3340* (MO-3511359, NY-375893, RB). GUYANA. Mazaruni Station, 8 May 1933, *T. G. Tutin 67* (RB); Matthew's Ridge, clearing at intersection WX-7 & ridge lines, 31 Jan. 1955, *R. S. Cowan 39374* (MO-2142368, RB). PERU. **Loreto:** Rio

Napo, near Entrada de Isla Inayuga, 20 Sep. 1972, *T. B. Croat 20533* (MO-2280655, RB).

2. *Casearia murceana* R. Marquete & Mansano, sp. nov. TYPE: Brazil. Pará: Santarém, 5 Mar. 1923, *A. Ducke s.n.* (holotype, RB-21427). Figure 2.

Species nova *Caseariae ulmifoliae* Vahl ex Vent. affinis, sed ab ea inflorescentis sessilibus, sepalis plerumque absque glandulis in lobis, filamentis villosis, antheris in glandulas apicales barbatae desinentibus atque ovario basi glabro inter medium et apicem dense villosa differt.

Trees, trunk with smooth to slightly wrinkled bark, brown; branches terete, without thorns, slender; trichomes yellowish, pilose, densely and/or sparsely tomentose, without lenticels. Stipules 2.5–5.5 × 0.6–1 mm, linear to narrowly lanceolate, oblong-elongate to subulate, caducous, villous or pilose on external face, with sparse trichomes on the internal face, more frequent at the apex of young branches, with glabrous apical gland, caducous; leaves persistent, dark, opaque on both faces, variable in size; blades (5.5–) 6.5–9(–19) × (3.5–)4.7–8 cm, elliptical, widely elliptical, or rarely obovate and asymmetrical, chartaceous, dark when dry, pilose on both faces; trichomes concentrated on the adaxial face, especially on the primary and secondary veins, sparser on blade surfaces; abaxial face pilose across the entire blade, more so on veins, apex caudate, rarely cuspidate with sharp tip, base attenuate to obtuse; margins sparsely serrate to serrate with glands on the serrations, translucent areas or dots not visible on adult leaves; (4 to)6 to 9(10) pairs of secondary veins widely ascendent; reticulate venation lax, but prominent on abaxial face, reticulation not noticeable on either face; petiole (2–)3–7.5(–8) mm, subterete, sparsely pilose to pilose or densely tomentose, thin. Inflorescences fasciculate, sessile, pauciflorous, (4 to)8 to 9(to 11) or more flowers, densely villous; bracts and bracteoles ca. 1 mm, ovate, scarious, few, pilose to glabrescent; pedicels 2–4 mm, terete, thin, articulate near sepals, with 0.5 mm from branch insertion to articulation, pilose to tomentose, yellowish green. Flower buds 5–8 × 3 mm, oblong, villous, green; sepals (3.5–)4–7 × 1.5–2 mm, lanceolate, elliptical or ovate with apex subrounded to subobtuse, fused at base; glands generally present, greenish, pilose externally and sparse trichomes internally, calyx tube villous; stamens with filaments 2–2.5 mm, terete, free, villous, fused at disk base and sepals; anthers oblong, obovate, to ovate, glabrous, connective undeveloped, dehiscence longitudinal, with lateral openings; apical gland long-barbate; lobes of disk 1 mm long, clavate, slightly flattened at apex,

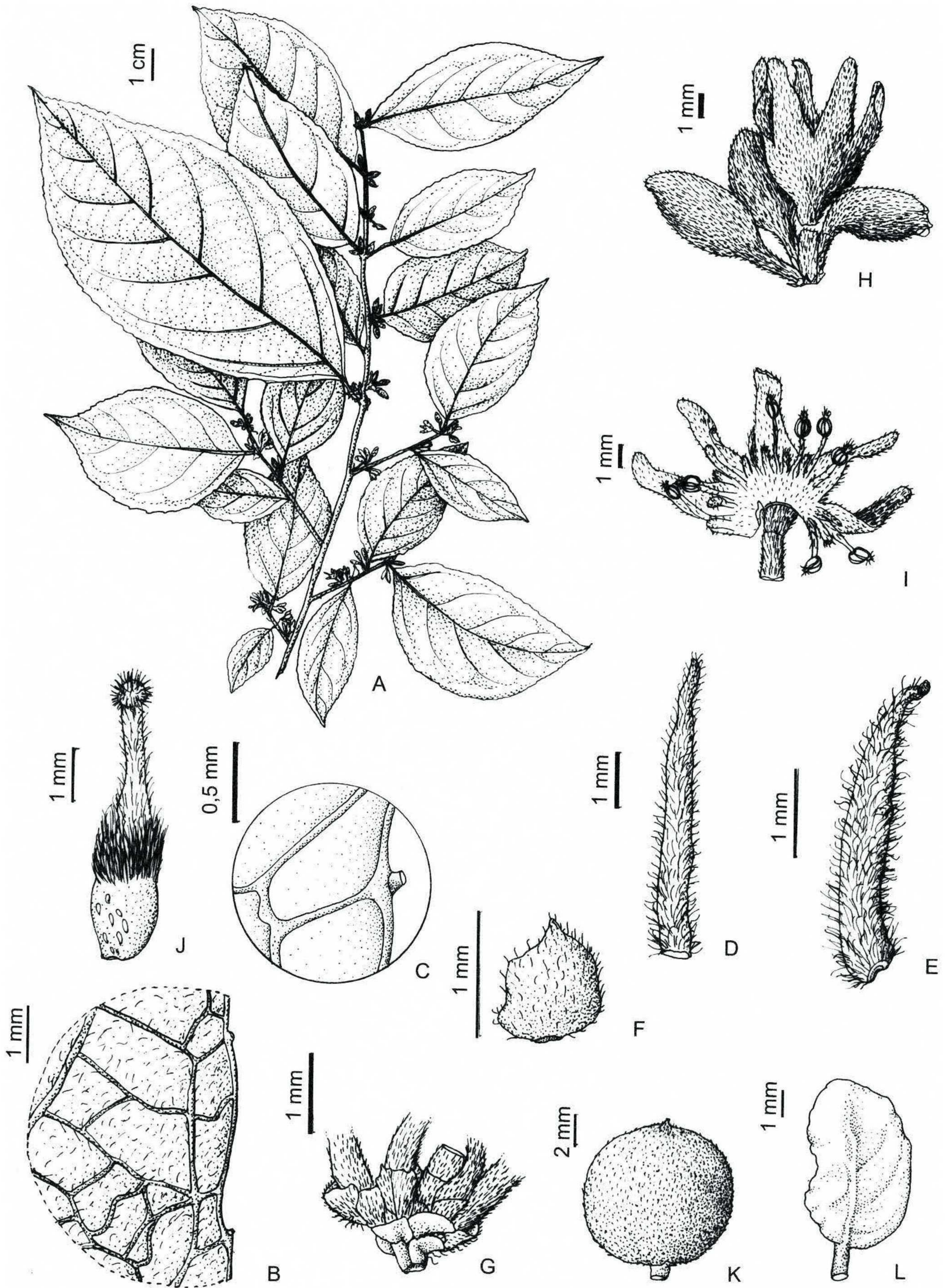


Figure 2. *Casearia murceana* Marquete & Mansano. —A. Branch with inflorescences presenting buds and flowers. —B. Detail of leaf blade and margin. —C. Detail of serration with gland. —D, E. Stipules. —F. Detail of bract. —G. Details of bracts and bracteoles at pedicel base. —H. Inflorescences with buds and flowers. —I. Detail of open flower. —J. Gynoecium with villous trichomes at apex. —K. Fruit. —L. Embryo. A–J from A. Ducke s.n. (RB-21427); K–L from P. Cavalcante & M. Silva 1762 (MG).

villous, fused at base and alternating with filaments; ovary ovate-elongate with salient glands on its surface, glabrous at base, densely villous from median portion to style; style thick, villous up to its insertion in ovary, sparsely pilose at apex; stigma clavate, hirsute. Fruits 1.8–1.9 × 1.8–1.9 cm, rounded, dehiscent into 3 valves, green when immature, densely canescent; peduncle 4 mm, thickened, pilose; seeds 8 to 10 per fruit, 1.2 × 0.9 cm, angular, black; testa slightly sulcate, black, aril small, yellowish; endosperm fleshy, internally sulcate; embryo straight, 1.1 × 0.8 mm, with prominent vascular bundles; cotyledon leaves oblong with rounded apex, slightly cordate at base; hypocotyl radicle, terete, truncate at apex.

Distribution. *Casearia murceana* is known to occur in the dense ombrophilous forests of Brazil.

IUCN Red List category. *Casearia murceana* is known from no more than 10 localities in the Amazonian region. According to IUCN Red List Criteria (IUCN, 2001), the species is considered Vulnerable (VUB2a).

Phenology. *Casearia murceana* flowers from January to July and occasionally in December, with very few fruits from December to July.

Etymology. The specific epithet honors João Murça Pires (1917–1994), who was a great researcher of Amazonian flora.

Discussion. *Casearia murceana* differs from *Casearia ulmifolia* by its sessile inflorescences, the sepals generally without glands on lobes, the villous filaments, the anthers with a barbate apical gland, and an ovary glabrous at base and villous from the median portion to the style. *Casearia murceana* also differs from *C. tenuipilosa* Sleumer in that it has yellowish pilose to tomentose branches, the leaves varying from elliptical to widely so, to rarely obovate, leaf adaxial surface sparsely pilose, the pedicels articulate near the sepals, the sepals generally with glands, calyx tube internally villous, ovary with glands, and fruit densely canescent. However, *C. tenuipilosa* has brownish hirsute branches, lanceolate, oblong-lanceolate to narrow obovate leaves, with the adaxial surface glabrous, except the veins, medium articulate pedicels, the sepals without glands, an internally glabrous calyx tube, ovary without glands, and fruit minutely tomentose.

Paratypes. BRAZIL. **Acre:** Brasiléia, 5 Nov. 1980, *B. Nelson* 852 (INPA, NY). **Amazonas:** Maués, Fomento Fed., 27 Oct. 1971, *M. F. Silva & L. Coelho* 29 (INPA). **Mato**

Grosso: Aripuanã, próximo a cachoeira, Centro Humboldt, 8 Oct. 1973, *G. T. Prance, C. C. Berg, F. A. Bisby, E. Lleras, W. C. Steward, J. F. Ramos, D. F. Coelho & J. F. Lima* 18207 (INPA, MG, MO-2373530); Aripuanã, 5 Aug. 1976, *M. Gomes & S. Miranda* 159 (INPA); Dardanelos, margem da estrada entre acampamento e porto, 3 Oct. 1975, *P. Lisboa, J. F. Ramos & G. A. Mota* 615 (INPA, MO). **Pará:** Altamira, rd. Transamazonica, trecho Altamira Itaituba, Km. 24, 21 Aug. 1978, *R. P. Bahia* 103 (MO-3496088, RB); Bragança, 24 Oct. 1926, *A. Ducke* s.n. (RB-21443); Marabá, estrada do Amapá, 28 Nov. 1970, *L. Coelho* 71 (INPA); Parauapebas, Serra dos Carajás, CTI do parque botânico, 22 Aug. 1988, *J. A. Bastos* 187 (MG); Santarém, 5 Mar. 1923, *A. Ducke* s.n. (RB-21427); Serra Diamantina, 14 Dec. 1966, *P. Cavalcante & M. Silva* 1762 (MG); estr. Cuiabá–Santarém, BR 163, Km. 941, 13 Nov. 1977, *G. T. Prance with A. S. Silva, M. J. Balick, C. C. Berg, A. J. Henderson, B. W. Nelson, R. P. Bahia & M. R. dos Santos* 25358 (MO-2662566, UEC); Alter do Chão, Sep. 1998, *W. E. Magnuson* s.n. (INPA-212042). **Rondônia:** Jarú, BR 364, Rod. Cuiabá–Porto Velho, Km. 423, linha 603, 2 July 1984, *C. A. Cid Ferreira* 4989 (INPA, MO-5158840); Santa Barbara, arredores de Santa Barbara, 15 km E do Km. 117, 12 Aug. 1968, *G. T. Prance & J. F. Ramos* 6868 (INPA).

3. *Casearia ulmifolia* Vahl ex Vent., *Choix* Pl. 46, 1808. *Guidonia ulmifolia* (Vahl ex Vent.) Baill., *Traité Bot. Méd. Phan* 2: 827. 1884. TYPE: Trinidad, 1778, *Ryan* 20 (holotype, C, F-21325 neg. of C; isotypes, B-Willd., BM, BR, G-DC, G-Ventenant, P-JU). Figure 3.

Casearia celtidifolia Kunth, *Nov. Gen. Sp.* [H.B.K.] (quarto ed.) 5: 363. 1821. TYPE: Venezuela. Terr. Fed. Amazonas: “prope Angostura et Carichana, ad ripam fluminis Orinoco,” *Humboldt & Bonpland* 1047 (holotype, P not seen; isotypes, B†, F neg. 13663 of B).

Casearia petraea Benth., *J. Bot. (Hooker)* 4: 111. 1841. TYPE: Guyana. Pirara, “stony savannahs,” *Schomburgk* 718 (holotype, K [barcode] 000471157 not seen, K photo; isotypes, BM not seen, F neg. 61246 of BM, FI not seen, K [barcode] 000471156 not seen, K photo, L [barcode] 00010758 not seen, L photo, P, US, W).

Casearia blanchetiana Miq., *Linnaea* 22: 801. 1849. TYPE: Brazil. Bahia: “forets des marais” Olhos d’água, *J. S. Blanchet* 3119 (holotype, U [barcode] 0002182 not seen, U photo; isotypes, B†, F neg. 13661 of B, BM, BR, F, FI, G, GH, K [barcode] 000471154 not seen, K [barcode] 000471154 photo, K [barcode] 000471155 not seen, K [barcode] 000471155 photo, L [barcode] 00010779 not seen, L photo, MO-1886703, NY-97933 not seen, NY photo, P, U [barcode] 0002181 not seen, U photo, W).

Casearia cambessedesii Eichler, *Fl. Bras. (Martius)* 13(1): 475. 1871. TYPE: Brazil. Minas Gerais: “sur les bords du Piracicaba a Itajuru,” *St.-Hilaire* B 1, nr. 608 (holotype, P; isotypes, F-935720 [P fragm.] not seen, F neg. 61271 of F-935720, L [barcode] 00010776 not seen, L photo).

Casearia celtidifolia Poepp. ex Eichler, *Fl. Bras. (Martius)* 13(1): 477, in obs. 1871, nom illeg. *Casearia tremifolia* J. F. Macbr., *Candollea* 8: 23. 1940, nom. nov. TYPE: Peru. Loreto: Maynas, *Poeppig* 2263

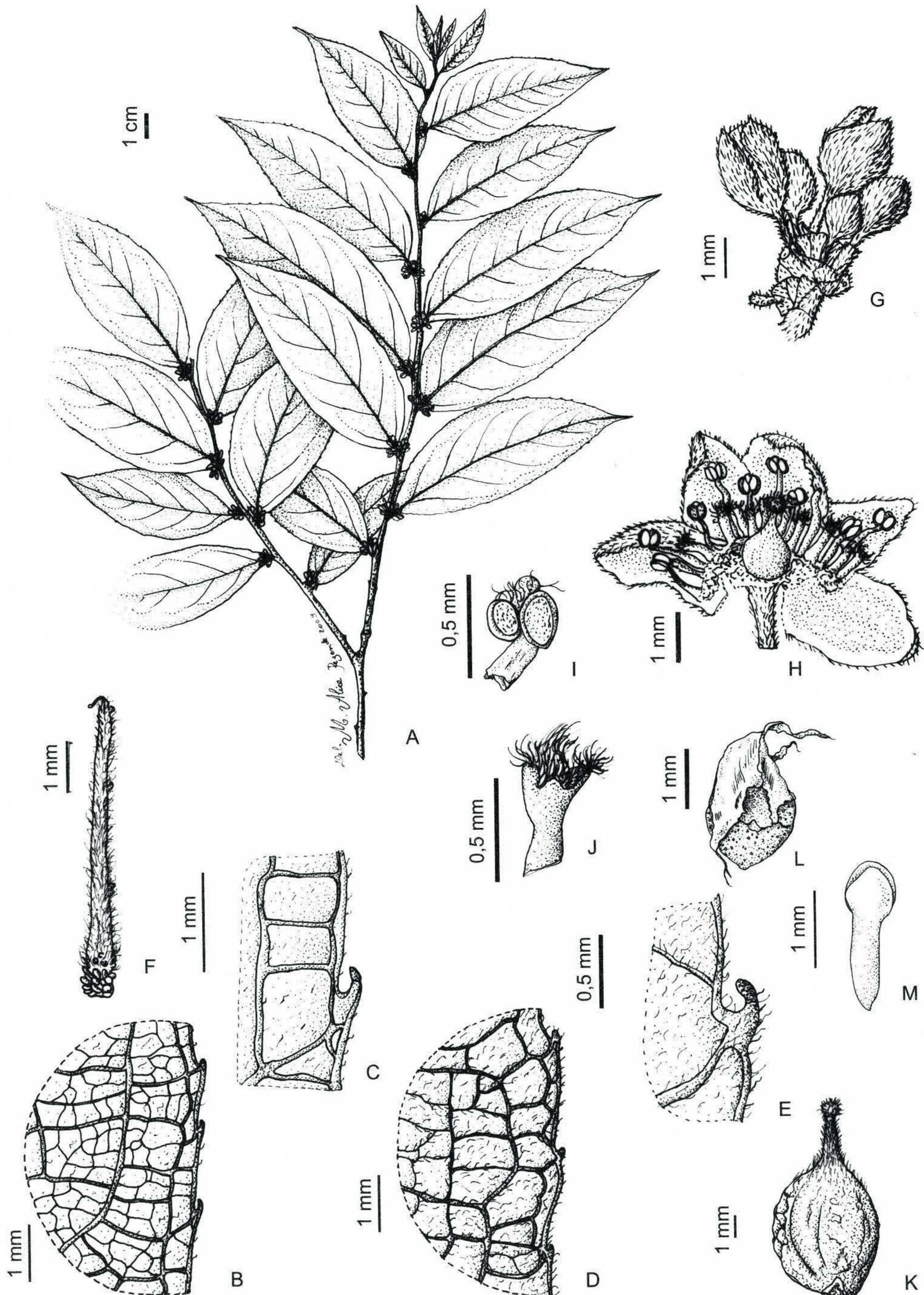


Figure 3. *Casearia ulmifolia* Vahl ex Vent. —A. Branch with inflorescences presenting buds and flowers. —B. Detail of leaf venation. —C. Detail of bristle with gland. —D. Detail of leaf venation with trichomes. —E. Detail of bristle with gland and sparse trichomes. —F. Stipule with glands at base. —G. Inflorescences with buds and flowers. —H. Detail of open flower. —I. Detail of anther. —J. Detail of disk lobe. —K. Gynoecium. —L. Seed with foveolate testa and fimbriate aril. —M. Spatulate embryo. A–C, I, J from Ryan 20 (C); D–H from A. Ducke s.n. (RB-35686); K from N. T. Silva & U. Brazão 60946 (IAN); L, M from J. L. de Souza 343 (INPA).

(holotype, W; isotypes, B†, F. neg. 13665 of B, F-869334 [B fragm.] not seen, F neg. 61156 of F-869334, P [B fragm.] not seen, L [barcode] 00010777 [B fragm.] not seen, L photo).

Trees or shrubs up to 12(–26) m tall \times 20+ cm DBH; trunk with smooth bark, brown; branches terete, without thorns, tomentose at apex of young branches, glabrescent at base, brown to black or greenish, with sparse lenticels. Stipules (5–)8–9 \times (0.5–)1 mm, linear, lanceolate to subulate, caducous, tomentose on both faces, more frequent on apex of young branches, glands at base of interior face, glandular emergences at margins; leaves persistent, discolorous, opaque on both faces, variable in size; blade (5–)6.5–10.4(–12.2) \times 2–4.3(–5.2) cm, oblong to lanceolate, membranaceous, lanceolate, trichomes tomentose on primary and secondary veins, sparser on blade surface, denser abaxially, translucent lines or dots dispersed through blade, apex acuminate, cuspidate to caudate, base short-attenuate, slightly asymmetrical, margins serrate, serrations glandular; 6 to 10(to 12) pairs of secondary ascendent veins, reticulation of veins and veinlets lax, more prominent on abaxial face; petiole (1–)1.5–4.5 mm, subterete, tomentose. Inflorescences fasciculate, ca. 20 to 30 flowers, pedunculate to short pedunculate, (2–)3–4 mm, tomentose; bracts and bracteoles 1–1.5 mm, ovate, hyaline, surrounding pedicel base, yellowish tomentose; pedicels 2–3 mm, terete, slightly flattened, articulate 0.5 mm from branch insertion to articulation apex, tomentose near sepals. Flower buds 1.5–2 \times 1–1.5 mm, oblong to globose, tomentose, greenish; sepals 5, 2.5–3 \times 1.5–2 mm, fused at base, ovate to oblong-ovate, externally tomentose, internally glabrous, glandular at apex, whitish on both faces (becoming more coriaceous at base, light brown, when dehydrated); stamens with filaments 1–1.5 mm, flattened, free, glabrous, fused at disk base; anthers oblong, connective undeveloped, dehiscence longitudinal, with lateral openings, rarely with few trichomes, on some thecae, with an apical, diminutive gland inside, glabrous to slightly barbate, brownish; disk lobes 0.5–0.6 mm long, 4-lobed apex, barbate to villous at apex, glabrescent and fused at base and alternating with filaments; ovary ovate, glabrous, tomentose or pubescent at style insertion; style short, glabrous or tomentose, glandular, stigma rounded to slightly capitate, hirsute. Fruit 6–7 \times 3–4 mm, dehiscent into 3 valves, ovoid when immature, glabrous internally, tomentose externally near its insertion in style, to glabrous near base; sepals persistent; seeds 4 to 6, 2 \times 1.5 mm, yellowish; aril thin, yellow, fimbriate, partially covering seed; testa foveolate, brown; endosperm fleshy, yellowish; embryo linear 1 \times 0.5 mm, yellow without spots on

surface; cotyledon leaves rounded; hypocotyl-radicle axis terete; embryo of fruit still young.

Distribution. *Casearia ulmifolia* is found in dense and open ombrophilous forests, semi-deciduous forest, savanna woodland, and wooded steppe-like savanna of Brazil. This species occurs in the Amazonian basin of Brazil and Venezuela, as well as in Trinidad, Guyana, and Peru.

Phenology. *Casearia ulmifolia* flowers from July to November and fruits from October to December.

Discussion. Our study agrees with some of the synonyms adopted by Sleumer (1980) for *Casearia ulmifolia*. However, comparisons of the type material of *C. cotticensis* (isotypes, K [barcode] 000471158, RB) and *C. reginae* (F neg. 50654 of the holotype) lead us to conclude that these species are synonyms but distinct from *C. ulmifolia*.

Based on the analyses of the isotypes of *Casearia tremifolia* (Poeppig 2263, F neg. 13665 of B†), *C. petraea* (Schomburgk 718, F neg. 61246 of BM), and *C. celtidifolia* (Humboldt & Bonpland 1047, F neg. 13663 of B), and the holotype of *C. ulmifolia* (Ryan 20, C), we verified that they should be kept in the synonymy of *C. ulmifolia*. The accepted synonyms have a similar leaf texture and shape, glands in the sepal inner face and apex, reduced and glabrous to slightly barbate anther apical glands, and an ovate ovary.

The holotype of *Casearia celtidifolia* deposited in the herbarium of Berlin was destroyed during World War II, but we were able to locate a photograph of it at F, under the epithet of *C. capitata* Kunth (Humboldt & Bonpland 1047, F neg. of B). The specimen was collected in Venezuela and the label has no collection date.

In our broadened circumscription, *Casearia ulmifolia* is characterized by the presence of pedunculate inflorescences, the sepals glandular at the apex, glabrous filaments, the anthers with glabrous to slightly barbate apical glands, and a glabrous ovary. Its great morphological plasticity led Sleumer (1980) to circumscribe it by uniting additional, distinct taxa, which has generated confusion in herbarium identifications.

In his treatment of the Neotropical *Casearia*, Sleumer mentioned the difficulty of distinguishing *C. arborea* (Rich.) Urb. from *C. ulmifolia* using sterile material. These taxa indeed share some similar characters, such as the leaf trichomes and shape, type of inflorescence, and gynoeceum indument. However, the stipules of *C. arborea* are narrowly ovate, velutinous and eglandular on the margins,

while those of *C. ulmifolia* are lanceolate to subulate, densely tomentose on both faces, and have marginal glands at the base. These two species also differ by the leaf apex and texture, anthers and ovary shape, and seed testa ornamentation.

In terms of geographic distribution and habitat, *Casearia cotticensis* appears to be more concentrated in the Amazon region of South America, ranging from Guyana and Peru in the west to the state of Maranhão in northeastern Brazil. The taxon is found in dense ombrophilous forests, occasionally in open areas. It is noted from elevations between 50 and 600 m, but it is more common at lower altitudes, up to 200 m, usually in sandy clay soils. In contrast, to date, collections of *C. murceana* appear restricted to Brazil, documented from the states of Acre, Amazonas, Mato Grosso, Pará, and Rondônia, from lowland sites in dense ombrophilous forest. *Casearia murceana* is more frequent at altitudes around 100 m. As currently known, *C. ulmifolia* is the most broadly distributed species in this complex, since the taxon reaches Peru to the west.

In Brazil, *Casearia ulmifolia* can be found in dense and open ombrophilous forest, semideciduous forest, savanna woodland, wooded steppe-like savanna, with a varying altitude of 52–950 m, preferentially at altitudes between 100 and 300 m (Fig. 4).

Representative specimens examined. BRAZIL. **Acre:** Cruzeiro do Sul, Rio Juruá-Mirim, 19 May 1971, P. J. M. Maas 13151 (INPA, MG, NY, R); Rio Branco, Parque Zoobotânico, 23 Jan. 1992, G. Claros, Cytia & Leonildo 36 (INPA); Boa Vista, Rio Branco, 23 Aug. 1943, A. Ducke 2071 (IAN, R). **Amapá:** Contagem entre Porot Platon e Serra do Navio, 10 Nov.–15 Dec. 1976, N. A. Rosa 1162 (MG). **Amazonas:** margem do rio Cauaburi, entre rios Maturacá e Yá, 2 Feb. 1996, N. T. Silva & U. Brazão 60946 (IAN); Lábrea, Rio Purus, Lago Preto, 20 June 1971, G. T. Prance 13749 (INPA, MG, R); along the Rio Tarauacá, 21 June 1933, B. A. Krukoff 4966 (SP); Manaus, colônia Santo Antônio, 3 Jan. 1969, L. Coelho & Byron s.n. (INPA-23879, UEC-28719); Manaus-Caracará rd., Km. 148, 27 Sep. 1973, C. C. Berg 18148 (INPA, MG). **Bahia:** Caetité, Tucano, 15 Mar. 1995, G. Hatschbach, M. Hatschbach & J. M. Silva 61927 (CEPEC, MBM); Camacã, estrada Rio Branco, plantação de cacão, 27 Jan. 1971, T. S. Santos 1433 (CEPEC, NY); Ilhéus, Fazenda Santa Maria, 28 Apr. 2001, R. H. R. Sambuichi 197a (IAC); Maracás, Faz. Cabloco, Lagoinha, 27 Feb. 2000, R. P. Oliveira et al. 401 (CEN, HUEFS). **Espírito Santo:** Linhares, Reserva Florestal da CVRD, Estrada Bicuiba, 12 Feb. 1973, J. Spada 185 (CVRD, UEC); Estrada Cinco folhas, 4 Feb. 1981, D. A. Folli 307 (CVRD, UEC). **Maranhão:** Barão do Grajaú, Dec. 2005, I. C. Nascimento Jr. 1659 (UB); Benedito Leite, Faz. Veneza, 23 Jan. 2005, A. M. Miranda 4762 et al. (Sergio Tavares, Universidade Federal Rural de Pernambuco, Recife, Pernambuco); Codó, Caxias, s.d., Capanema (RB); Fortuna, lugar Caiçara, a 15 km SE de Fortuna, 21 Feb. 1983, N. A. Rosa, Rosário, T. Rebbeck, J. B. F. da Silva & M. R. dos Santos 642 (MG, MO-5952102); Codó, 18 June 1907, A. Ducke s.n. (MG-623); Grajaú, 42 km due NE of

city of Grajaú, on old rd. to Barra do Corda, 10 Feb. 1970, G. Eiten & L. T. Eiten 10269 (NY, SP, UB); Loreto, Ilha de Balsas region betw. the Balsas & Parnaíba rivers, 7 Feb. 1970, G. Eiten & L. T. Eiten 10493 (NY, SP, UB); 10 Feb. 1970, G. Eiten & L. T. Eiten 10543 (NY, SP); Parnarama, Mirindiba, estrada de barro, 1 Mar. 2005, A. M. Miranda et al. 4914 (Sergio Tavares, Universidade Federal Rural de Pernambuco, Recife, Pernambuco); Santa Barbara due SSE of Loreto, on shore of rio Parnaíba, 1 June 1967, G. Eiten & L. T. Eiten 4809b (SP); Santa Luzia, Faz. Agripec.-Varig, caminho para rio Mutum, 5 Apr. 1983, M. F. F. da Silva 1011 (HRB, IAN, INPA, MG, NY). **Minas Gerais:** Chácara, Jan. 1978, M. Ponce 15462 (CESJ, UEC); Caratinga, Est. Biol. Caratinga, 19 Dec. 1984, M. A. Lopes & P. M. Andrade 663 (BHCB); same locality, 19 Jan. 1990, L. V. Cota s.n. (BHCB-19254); Matão, 18 Jan. 1985, P. M. Andrade & M. A. Lopes 591 (UEC); Mata do João, 3 Jan. 1986, M. A. Lopes & S. F. Ferrari 902 (UEC); Mata do João, 18 Jan. 1986, M. A. Lopes & S. F. Ferrari 920 (BHCB, UEC); Mata do Jaó, 3 Dec. 2001, J. V. Gomes 776 (BHCB, MBM, SPF), 18 Jan. 1986, M. A. Lopes & S. F. Ferrari 883 (BHCB, IAC), 3 Jan. 1986, M. A. Lopes & S. F. Ferrari 880 (BHCB, IAC); Fazenda Montes Claros, 7 Jan. 1991, J. R. Stehmann & C. V. Mendonça Filho s.n. (BHCB-20285); Carandaí, pedra do Sino Hotel Fazenda, BR 040, Km. 6 (RB); Trilha do sagüi, 9 Feb. 2006, N. F. Mota & D. Souza 568 (BHCB); Dionisio, Parque Estadual do Rio Doce, 3 Feb. 2004, G. S. França & F. Raggi 506 (BHCB, CESJ); Santana do Riacho, 13 Oct. 2003, A. Furlan s.n. (SP-209866), Km. 126, 19 Dec. 1979, J. R. Pirani s.n. (SP-186207); Viçosa, Recanto das Cigarras, Reserva Biológica, 20 Dec. 2005, E. P. Campos 179 (IAC); campus da Universidade Federal de Viçosa, s.d., A. F. Silva & N. R. Fontes 142 (IAC, RB, VIC); agricultura College Lands, 27 Dec. 1929, Y. Mexia 4174 (IAN, NY, RB, VIC). **Pará:** Rio Jarí, Serra de Arumanduba, 25 July 1961, W. A. Egler 45993 (IAN, MG); Altamira, Rio Xingu, Reserva Indígena dos Assurinis, 27 Jan. 1917, S. A. M. Souza 857 (MG); no Xingu, acampamento base da cachoeira do Espelho, 17 Feb. 1987, A. T. G. Dias 1174 (MG, SPF); Barcarena, arredores da pousada Japiim, 17 Mar. 2002, A. S. da Silva 3590 (MG, SP, SPF); Marabá, estrada de Marabá, Km. 45, 24 Jan. 1971, B. G. S. Ribeiro 38 (IAN); Serra dos Carajás, estrada do Manganês, 19 Jan. 1985, O. C. Nascimento & R. P. Bahia 922 (MG); Tucuruí, área 4 das obras da UHI, 17 Dec. 1983, M. F. F. da Silva 443 (HRB, MG). **Piauí:** Boa Hora, Camumbi, próximo à casa de D. Raimunda, 25 June 1999, A. Ricardo França s.n. (RB, TEPB-10580); Brasileira, Parque Nacional de Sete Cidades, Baixa do Barreiro (6ª cidade), 23 Jan. 2001, M. E. Alencar et al. 1163 (TEPB, UEC); Piracuruca, Parque Nacional Sete Cidades, 29 Feb. 1980, A. J. Castro s.n. (TEPB-1026); Campo Maior, PI 115, Km. 6, 8 Mar. 1982, F. M. T. Freire s.n. (RB-479062, TEPB-2926); Uruçuí, próximo ao rio Uruçuí Preto, margem da estrada, 21 Jan. 2005, A. M. Miranda et al. 4681 (Sergio Tavares, Universidade Federal Rural de Pernambuco, Recife, Pernambuco). **Rondônia:** Ji-Paraná, travessia da gleba g, 7 Apr. 1983, M. G. Silva 6107 (INPA, MG); Porto Velho, córrego da Raiz, BR 364, 19 Apr. 1987, M. Nee 34945 (INPA, SP); Km. 8 da rodovia, 27 June 1952, J. F. Silva 219 (IAN); Vilhena, Fazenda Flor da Serra, Estrada para Aripuanã, 20 May 1984, C. S. Rosario 378 (MG). **Roraima:** Boa Vista, rio Branco, June, J. G. Kuhlmann 488 (RB); margens dos campos altos, 3 July 1937, A. Ducke s.n. (RB-35686); Boa Vista–Caracará rd. (BR-174), 58 km S of Boa Vista, 31 Jan. 1969, G. T. Prance 9515 (INPA); Faz. Sacramento, 25 Nov. 1978, J. L. de

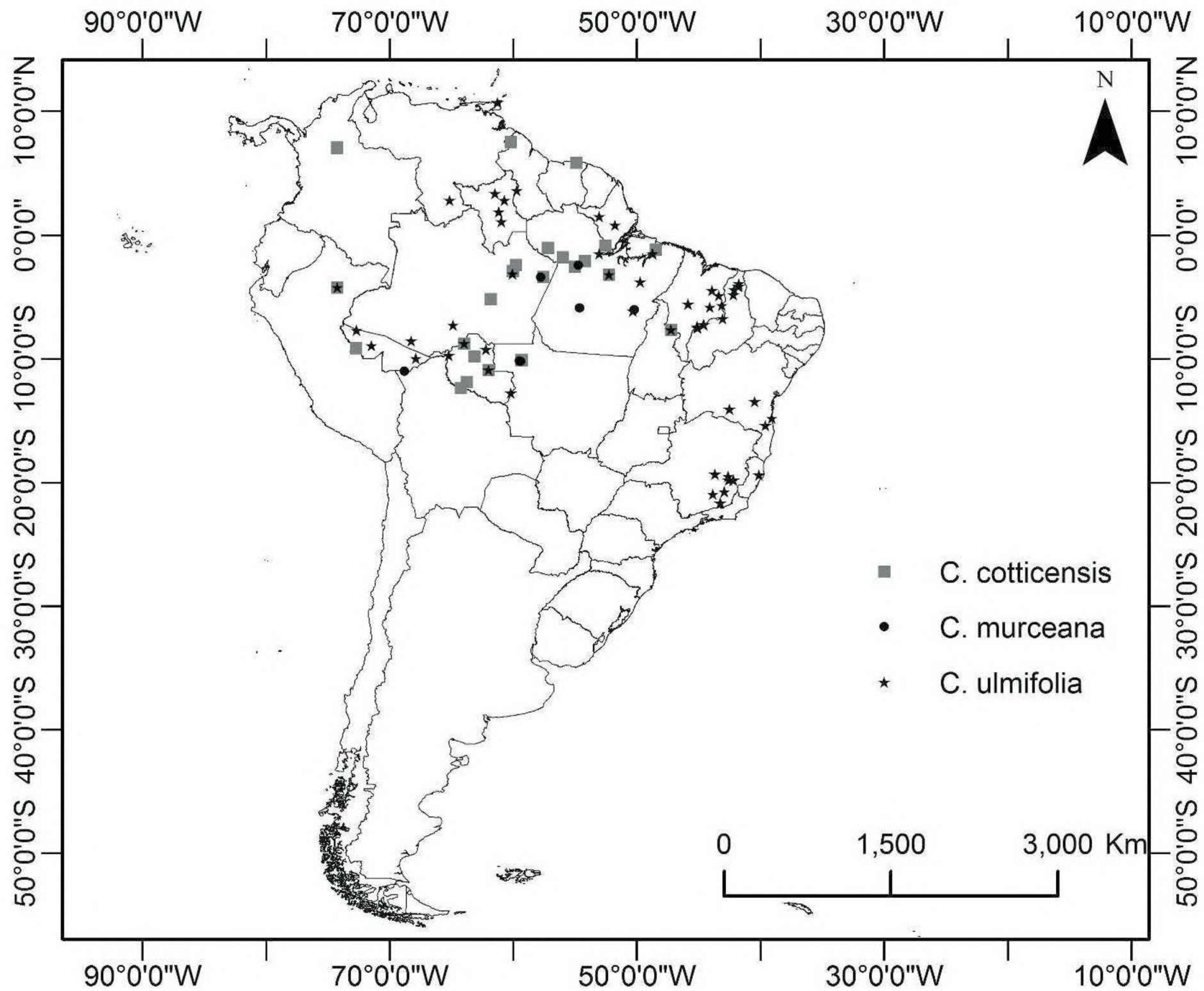


Figure 4. Geographical distribution map of the species of the *Casearia ulmifolia* complex.

Souza 343 (INPA); rd. BR-401, que liga Boa Vista-Bonfim, Km. 3, beira de estrada, 2°50'N, 60°40'W, 31 July 1986, *J. A. Silva et al. 509* (MO-5952099, UB); Sema Ecological Station, Ilha do Maracá, Santa Rosa, 13 Feb. 1987, *J. A. Ratter 5694* (INPA). PERU. **Lamas:** Distr. Alonso de Avaredo, San Juan de Facaícapa, 12 July 1977, *J. Schumke V. 9704* (MG); s.d., *E. F. Poeppig 13665* (IAN). VENEZUELA. **Barinas:** Carretera Barinas, San Cristobal, 14 June 1979, *L. M. Berti & I. Peña 230* (SP, VEN).

Taxonomic discussion. Three distinct taxa are recognized for the *Casearia ulmifolia* complex. The most broadly distributed and variable species, *C. ulmifolia*, can be best distinguished by the glands on the margins of its stipules, the leaves with serrate margins, the oblong anthers with longitudinal dehiscence, the disk lobes with a tetralobate apex, barbate to villous at apex, the sepals glandular at apex, and a pilose ovary apex, especially at insertion with styles. *Casearia murceana* can be best characterized by its apical gland in the stipule, the leaves with sparse teeth or with less serrate margins, the oblong, obovate to ovate anthers with longitudinal dehiscence, the disk lobes with a flattened, clavate apex, the sepals with glands generally present, and the gynoecium with trichomes extending from the middle of the ovary to the top of the style. Finally, *C. cotticensis* is identified by the absence of stipular

glands, the leaf margins serrate to serrulate, the deltoid anthers with transverse dehiscence at the base, the disk lobes with a clavate apex, the sepals with glands, and the ovary and style usually glabrous.

KEY TO THE SPECIES OF THE *CASEARIA ULMIFOLIA* COMPLEX IN NORTHERN SOUTH AMERICA/BRAZIL AND ADJACENT COUNTRIES IN NORTHERN SOUTH AMERICA

- 1a. Leaves coriaceous, blades with primary and secondary veins tomentose, but glabrescent elsewhere, venation prominent on the adaxial face; anthers deltoid, connective developed with glabrous or subglabrous apical gland, anther dehiscence transverse, with openings turned downward; stigma tomentose 1. *C. cotticensis*
- 1b. Leaves chartaceous or membranaceous, blades tomentose throughout both faces or pilose near the primary vein, venation not prominent on adaxial face; anthers oblong, connective undeveloped, with apical gland barbate to glabrous, anther dehiscence longitudinal, with lateral openings; stigma hirsute 2
- 2a. Inflorescences sessile; filaments villous, anthers with barbate apical gland; ovary glabrous at base, densely villous from the median portion to the style; cotyledon leaves oblong 2. *C. murceana*
- 2b. Inflorescences pedunculate to short pedunculate (2-)3-4 mm; filaments glabrous, anthers with glabrous to slightly barbate apical gland; ovary glabrous, tomentose or pubescent at

style insertion, tomentose at style insertion;
cotyledon leaves rounded 3. *C. ulmifolia*

Acknowledgments. This work was part of the first author's Ph.D. thesis at the Botany Graduate Program of the Instituto de Pesquisas Jardim Botânico do Rio de Janeiro. The authors thank the curators of herbaria BHCB, C, CEN, CESJ, Sergio Tavares, Universidade Federal Rural de Pernambuco, Recife, Pernambuco, HUEFS, IAN, INPA, MG, RB, RBR, TEPB, UB, UEC, and VIC for lending specimens or allowing us to examine their collections, as well as Maria Alice Rezende for the illustrations and Dewey Litwiller for reviewing the English.

Literature Cited

- Angiosperm Phylogeny Group. 2009. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG III. *Bot. J. Linn. Soc.* 161: 105–121.
- Breteler, F. J. 2008. A synopsis of *Casearia* Jacq. (Samydeae–Salicaceae) in West and Central Africa with a description of a new species from Eastern Congo (Kinshasa). *Kew Bull.* 63: 101–112.
- Chase, M. W., S. Zmarzty, M. D. Lledó, K. J. Wurdack, S. M. Swensen & M. F. Fay. 2002. When in doubt, put it in Flacourtiaceae: A molecular phylogenetic analysis based on plastid *rbcL* DNA sequences. *Kew Bull.* 57: 141–181.
- Font Quer, P. 1979. *Diccionario de Botánica*. Editorial Labor, Barcelona.
- Hickey, M. & C. King. 2000. *The Cambridge Illustrated Glossary of Botanical Terms*. Cambridge University Press, Cambridge, United Kingdom.
- Instituto Brasileiro de Geografia e Estatística (IBGE). 2004. *Mapa da Vegetação do Brasil*. Ministério do Planejamento. Instituto Brasileiro de Geografia e Estatística. <ftp://geoftp.IBGE.gov.br/mapas_murais/vegetação.pdf>, accessed 15 March 2010.
- IUCN. 2001. *IUCN Red List Categories and Criteria, Version 3.1*. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland, and Cambridge, United Kingdom.
- Macbride, J. F. 1936. Flacourtiaceae. Pp. 350–359 in L. Williams, *Woods of Northeastern Peru*. Botanical Series, Publication 377, Vol. 15. Field Museum of Natural History, Chicago.
- Sleumer, H. O. 1954. Flacourtiaceae. Pp. 1–106 in C. G. G. J. van Steenis (editor), *Flora Malesiana, Series I, Vol. 5*. Noordhoff-Kolff NV, Jakarta.
- Sleumer, H. O. 1980. Flacourtiaceae. Pp. 1–499 in *Flora Neotropica Monograph, Vol. 22*. The New York Botanical Garden Press, New York.
- Stern, W. T. 1992. *Botanical Latin*. David & Charles, London.
- Veloso, H. P., A. L. R. Filho Rangel & J. C. A. Lima. 1991. *Classificação da Vegetação Brasileira, adaptada a um Sistema Universal*. IBGE, Rio de Janeiro.